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This 18 -09- 1997 היום

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חוק הפטנטים, תשכ"ז - 1967
PATENT LAW - 5727 - 1967

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בקשה לפטנט
Application for Patent

אני, (שם המבקש, מענו ולגבי גוף מאוגד - מקום התאגדותו)
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Owner, by virtue of

ששמה הוא
of an invention the title of which is

(בעברית) תערבת רוקחות
(Hebrew)
(באנגלית)
(English)
PHARMACEUTICAL COMPOSITION

מבקש בזאת כי ינתן לי עליה פטנט.
hereby apply for a patent to be granted to me in respect thereof.

*בקשת חלוקה - Division of Application	*בקשה פטנט מוסף - Addition Application for Patent	*דרישה דין קדימה Priority Claim		
מבקשת פטנט Application from	לבקשה/לפטנט to Patent/Application	מספר / סימן Number / Mark	תאריך Date	מדינת האגוד Convention Country
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BY:

היום 12 בחודש ספטמבר שנה 1996
This 12 of September of the year 1996

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This form, impressed with the Seal of the Patent Office and indicating the number and date of filing, certifies the filing of the application the particulars of which are set out above

* מחק את המיותר - *Delete whatever is inapplicable

תערבת רוקחות

PHARMACEUTICAL COMPOSITION

YAROM COHEN

The present invention relates to a pharmaceutical composition comprising as active ingredient somatostatin or one of its analogs (as herein defined) for the treatment of syndrome X of Reaven (also called "Hyper Insulinemia syndrome" or "The Deadly Quartet).

Somatostatin and its analogs, e.g. octreotide, are known for the treatment of the reduction of the secretion of insulin caused by insulimonas. Moreover, they are known for the treatment of certain tumors, gastrointestinal diseases, etc. However, they have so far not been known for their effectivity for the reduction of the resistance to insulin and for the treatment of syndrome X of Reaven.

Syndrome X includes, inter alia, the following risk factors: a. excessive blood pressure; b. dislipidemia, i.e. increase of the amount of triglycerides in the blood, reduction of the amount of HDL and increase of the amount of LDL, c. excessive blood coagulation due to plasminogen activator inhibitor-1 (PAI-1) increased inthe blood; d. central obesity; e. Glucose intolerances - from ocult diabetes to overt diabetes f. increase of Insulin in the blood, i.e. the pancreas secretes more Insulin in order to overcome high Insulin resistance.

All the risk fators of syndrome X of Reaven are, inter alia, caused by a high resistance to Insulin. Thus, apparently said symptoms could be treated simultaneously if there would be a reduction to the resistance to Insulin.

Said risk factors either separately but mostly in combination are decisive factors in the appearance of periferal vascular diseases (atherosclerosis), which causes, inter alia, Ichemic Heart diseases, e.g. angina pectoris, myocard infarct; cerebral vascular diseases and the like.

Until now, all said risk factors had to be treated separately

as there was no pharmaceutical composition which could treat simultaneously all of them. However, said separate treatments are not always effective as very often the treatment of one risk factor severes the condition of another risk factor. It has therefore been desirable to find a pharmaceutical composition which can treat simultaneously all the various risk factors which are included in syndrome X of Reaven.

We have now found that due to the fact that the reduction of the resistance to Insulin can be achieved by administering Somatostatin or one of its analogs, said treatment may enable the treatment of all risk factors of syndrome X of Reaven simultaneously.

The present invention thus consists in pharmaceutical preparations for the treatment of the risk factors of syndrome X of Reaven comprising as active ingredient Somatostatin or one of its analogs (as herein defined).

The present invention also comprises the use of Somatostatin or one of its analogs (as herein defined) in the preparation of a pharmaceutical preparation for the treatment of the risk factors of syndrome X of Reaven.

Analogs in connection with the present invention mean any analog compound of somatostatin which biologically activate one or more somastostatin receptors. Said receptors cause the reduction to the resistance to Insulin and thus enable the combined treatment of all risk factors of syndrom X of Reaven and are thus effective in primarily & secondary preventing and/or treating Periferal vascular diseases (atherosclerosis), e.g.Ichemic Heart diseases, such as, angina pectoris, myocard infarcts ; cerebral vascular diseases, etc.

As receptors there should be mentioned, inter alia, the

following human somatostatin receptors, which are described in Steven W.J. Lamberts, et al. 1996. Octreotide.. The New England Journal Med. Jan. 25. pp. 246-54. These receptors are:

1. hSSTR1

Present in the brain, lung, stomach, jejunum, kidneys, liver and pancreas. It is located on chromosom 14q13. It has 391 amino acids and its formula is given in Yamada et. al., Biochemical and Biophysical Research Communications, 1993, Vol. 195, No. 2., pages 844-852.

2. hSSTR2

Present in the brain and in the kidneys, It is located on chromosom 17q24. It has 369 amiono acids and its formula is given in Yamada.

3. hSSTR3

Present in the brain and in the pancreas. It is located on chromosome 22q13.1. It has 418 amino acids and its formula is given in Yamada.

4. hSSTR4

Present in the brain and in the lung. It is located on chromosome 20. It has 388 amino acids and its molecular weight is 41,867. Its formula is given in Yamada.

5. hSSTR4

Present in the brain, heart, adrenal glands, placenta, pituitary, small intestines and skeletal muscles. It is located on chromosome 20p11.2. It has 364 amino acids, its molecular weight is 39,176 and its formula is given in Yamada.

All receiptors have common features:

1. They have a similarity in the configuration in the seven areas which do extend out of the membrane TM1....TM7)

2. Asp-Arg-Tyr at the end of the NH -terminal of the second loop which is in the cell.

3. Aspartic acid (Asp) is located in the third loop outside the cell.

The receptors which are especially important in reducing the Insulin resistance are receptors 2 and 5, also but less receptor 3. Receptors 1 and 4 are less important in this respect.

The use of Somatostatin is not always satisfactory as it is effective only for a short time. Therefore the use of Octreoide, the most known analog of Somatostatin or of another long acting Somatostatin, is preferred.

The analogs should comprise the chain D-Trp-Lys. Said chain constitute the critical core of the active analogs and is essential for the activation of the receptors.

Most analogs comprise the chain Phe-D-Trp-Lys

Many analogs comprise the chain Phe-D-Trp-Lys-Thr being present in positions 7 - 10 of Somatostatin 14. should preferably be part of the analogs.

Suitable analogs of somatostatin being part of the pharmaceutical composition according to the present invention are, for example,:

1. Octreotide.
2. Vapreotide.
3. Lanreotide.
4. Cyclopeptide somatostatin analogues selected among :

Cyclo[Pro-Phe-D-Trp-Lys-Thr-Phe]

Cyclo[N-Me-Ala-Tyr-D-Trp-Lys-Val-Phe]

Cyclo[Pro-Ala-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Tyr-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-β-aminobutyric-Phe]

Cyclo[N-Me-Ala-Phe-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-Val-Phe]

Cyclo[D-Ala-D-Phe-D-Trp-L-Lys-D-Thr-N-Me-D-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-Thr(Bzl)] (Bzl = (a)

Cyclo[Pro-Phe-D-Trp-Lys-Thr]

Cyclo[Pro-D-Phe-D-Trp-Lys-Thr(Bzl)]

Cyclo[Ahep-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Tyr-Thr-Ser] (Ahep =(b)

Cyclo[Ahep-Phe-D-Trp-Lys-Thr(Bzl)]

Cyclo[Ahep-Phe-D-Trp-Lys-Thr]

Cyclo[Ahep-Phe-D-Trp-Lys-Ser(Bzl)]

Cyclo[Ahex-Phe-D-Trp-Lys-Thr(Bzl)] (Ahex = (c)

Cyclo[Aoct-Phe-D-Trp-Lys-Thr(Bzl)] (Aoct = (d)

Cyclo[Ala-Cys-Phe-D-Trp-Lys-Thr-Cys]

(a) Bzl = benzyl

(b) Ahep = 7-aminoheptanoyl

(c) Ahex = 6-aminohexanoyl

(d) Aoct = 8-amino-octanoyl;

5. D-Phe-[Cys-Phe-D-Trp-Lys-Thr-Cys]-Thr-ol

6. D-Nal-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Thr-NH_2 (Nal = (1)

7. D-Phe-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Nal-NH_2

8. D-Phe-[Cys-Tyr-D-Trp-Lys-Thr-Cys]-Nal-NH_2

9. D-Phe-[Cys-Tyr-D-Trp-Lys-Abu-Cys]-Nal-NH_2 (Abu = (2)

10. D-Phe-[Cys-Tyr-D-Trp-Lys-Ser-Cys]-Nal-NH_2

11. D-Nal-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Nal-NH_2

12. c(Ahep-Trp-D-Trp-Lys-Thr-Phe) (Ahep = (3)

13. D-Phe-Cpa-Tyr-D-Trp-Lys-Thr-Phe-Thr-NH_2 (Cpa = (4)

14. D-Phe-Cpa-Tyr-D-Trp-Lys-Val-Phe-Thr-NH_2

15. D-Phe-Phe-Phe-D-Trp-Lys-Thr-Phe-Thr-NH_2

16. D-Phe-Phe-Phe-D-Trp-Lys-Val-Phe-Thr-NH_2

17. D-Phe-Phe-Tyr-D-Trp-Lys-Val-Phe-D-Nal-NH_2

18. D-Phe-Ala-Phe-D-Trp-Lys-Ala-Nal-NH_2

19. D-Phe-Phe-Phe-D-Trp-Lys-Val-Phe-Thr-NH_2

20. D-Phe-Phe-Phe-D-Trp-Lys-Thr-Phe-Thr-NH_2

21. D-Phe-Phe-Tyr-D-Trp-Lys-Val-Phe-D-Nal-NH_2

(1) Nal L-3(2-naphthyl)alanine

(2) Abu L-α-amino-n-butyric acid

(3) Ahep 7,aminoheptanoic acid

(4) Cpa L-p-chlorophenylalanine

22. Polypeptides of the formula:

X-Lys-Asn-Phe-Phe-A-Lys-Thr-Phe-Thr-Ser-Y

wherein A is L- or D-Trp,

X is H-$(Aeg)_m$-Cys- or H-$(Aeg)_m$-Ala-Gly-Cys-,

Y is -Cys-$(Aeg)_n$-OH or

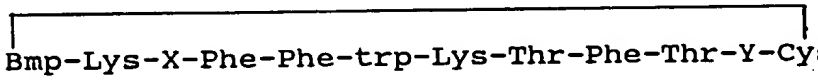
X and Y taken together are a 2-aminoethyl-glycyl group in the ring position and

m and n are 0, 1, 2, provided that

m and n are at least 1,

and their cyclic disulfide derivatives.

23. A peptide of the formula:



in which

Bmp represents the desaminocysteine radical,

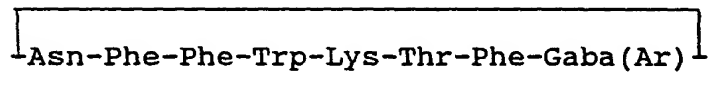
X represents Asn,

trp represents D-Trp that may be substituted

in the benzene ring by a halogen atom, and

Y represents the radical of an alpha-(lower alkyl)amino-(lower alkyl)-carboxylic acid having a minimum of 4 and a maximum of 8 carbon atoms, in which the two lower alkyl radicals can be connected to one another with a single C-C bond, an oxygen atom or a sulphur (II) atom.

24. Cyclic octapeptides of the formula



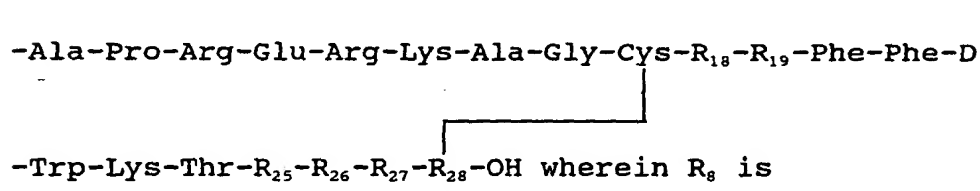
in which

Trp represents L-Trp or D-Trp, in which the benzene ring may be substituted by a fluorine atom, and

Gaba(Ar) represents the residue of a γ-aminobutyric acid substituted by a cyclic hydrocarbyl radical Ar selected from the group consisting of cyclohexyl; phenyl optionally substituted by halogen, nitro or phenoxy; and naphthyl optionally substituted by halogen.

25. A compound of formula

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-R_8



wherein R_8 is Met or Leu, R_{18} is Lys or des R_{18}, R_{19} is Asn or

des R_{19}, R_{25} is Phe or Tyr, R_{26} is Thr or des

R_{26}, R_{27} is Ser or D-Ser and R_{28} is D-Cys or Cys.

26. A compound of formula

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-R_8-Ala-Pro

-Arg-Glu-Arg-Lys-Ala-Gly-Cys-R_{18}-R_{19}-Phe-Phe-D-Trp-Lys

-Thr-R_{25}-R_{26}-R_{27}-R_{28}-OH wherein R_8 is Met or

Leu, R_{18} is Lys or des R_{18}, R_{19} is Asn or des

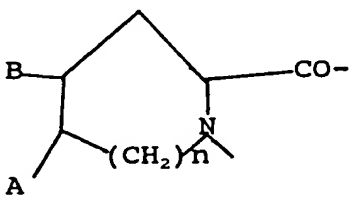
R_{19}, R_{25} is Phe or Tyr, R_{26} is Thr or des R_{26},

R_{27} is Ser or D-Ser and R_{28} is D-Cys or Cys, or the linear version thereof where the disulfide bridge is replaced by hydrogen.

27. A cyclic hexapeptide of the formula

[X - Phe-D-Trp-Lys-Y-Phe]

in which X represents the radical of an L-aminoacid of the formula

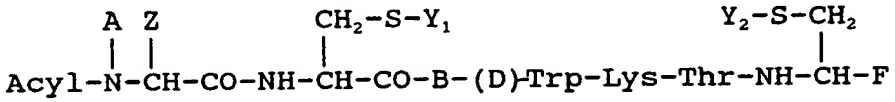


in which A and B are identical or different and denote alkyl having 1 to 3 carbon atoms, or A and B together represent a saturated, unsaturated or aromatic monocyclic or bicyclic structure having 3 to 6 carbon atoms,

n denotes 0 or 1, and

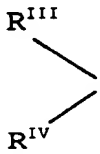
Y represents an aliphatic or aromatic L-aminoacid the side-chair of which can be hydroxylated, said amino acid being selected from the group consisting of L-alanine, L-serine, L-valine, L-leucine, L-isoleucine, L-phenylalanine and L-tyrosine.

27. An N-acyl-polypeptide of formula,



wherein

"Acyl" is a group of formula $R^{I}CO-$ wherein R^{I} is C_{1-20} alkyl or phenyl; a group of formula $R^{II}SO_2-$ wherein R^{II} is $C_{1-20}-$ alkyl, phenyl or tolyl; a group



wherein

R^{III} and R^{IV} are each independently hydrogen or C_{1-10}alkyl; or biotinyl,

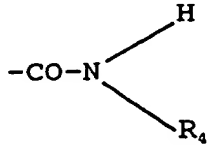
A is hydrogen or C_{1-3}alkyl,

>N-CH(Z)-CO- is an (L)- or (D)-phenylalanine residue optionally ring-substituted by NO_2, or an (L) or (D)-norleucine residue,

whereby

Z in  N-CH(Z)-CO- represents the remainder of said residue,

B is -Phe- optionally ring-substituted by NO_2,

F is a group of formula 

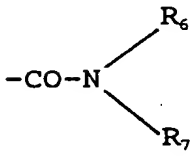
wherein R_4 is hydrogen or a group of formula

$-CH(R_5)-X$,

R_5 is $CH_3CH(OH)-$, i-butyl or benzyl

X is a group of formula $-COOR_1$,

$-CH_2OR_2$ or



wherein R_1, R_6 and R_7 are each hydrogen or C_{1-3}alkyl, and

R_2 is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

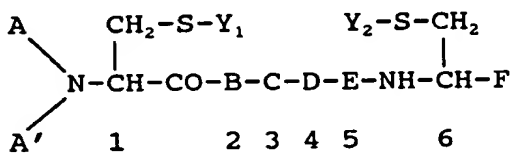
the group $-CH(R_5)-X$ having the (D)- or (L)-configuration, and

Y_1 and Y_2 are each hydrogen or together represent a direct bond, whereby the residue resides in the 2- and 7-position each indepen-dently have the (L)- or (D)-configuration,

and with the proviso that:

i) (L)- and/or (D)-cysteine residues are present at the 2- and 7-positions only.

29. A polypeptide of the formula



wherein

A is C_{1-12}alkyl, C_{7-10}phenylalkyl or a group of formula RCO-,

whereby

i) R is hydrogen, C_{1-11}alkyl, phenyl or C_{7-10}phenylalkyl, or

ii) RCO- is a) an L- or D-phenylalanine residue optionally ring-substituted by halogen and/or C_{1-3}alkyl,

b) H-Asn-, or

c) H-Nle-Asn-,

the α-amino group of amino acid residues a) and b) and the N-terminal amino group of dipeptide residues c) being optionally mono- or di-C_{1-12}alkylated,

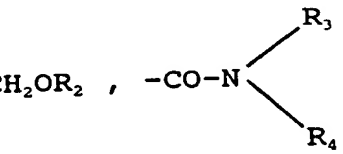
A′ is hydrogen or, when A is C_{1-12}alkyl or C_{7-10}phenylalkyl, also C_{1-12}alkyl or C_{7-10}phenylalkyl,

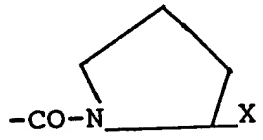
B is -Phe-optionally ring-substituted by halogen and/or C_{1-3}alkyl,

C is -(L)- or -(D)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen and/or C_{1-3}alkyl,

D is -Lys- optionally α-N-methylated and optionally Σ-N-C_{1-3}-alkylated,

E is -Thr- or -Ala- each in (D)- or (L)-form and each being optionally α-N-methylated,

F is a group of formula $-COOR_1$, $-CH_2OR_2$,  or



wherein R_1 is hydrogen or C_{1-3}alkyl,

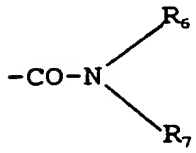
R_2 is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

R_3 is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}-phenylalkyl,

R_4 is hydrogen, C_{1-3}alkyl or, when R_3 is hydrogen or methyl, also a group of formula $-CH(R_5)-X$,

R_5 is hydrogen, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, $-CH_2-OH$, $-CH(CH_3)-OH$, isobutyl or benzyl

X is a group of formula $-COOR_1$, $-CH_2OR_2$ or



wherein

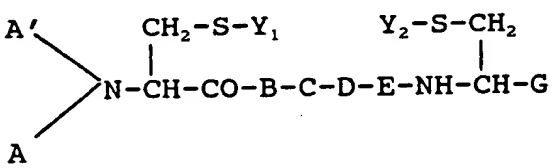
R_1 and R_2 have the meanings given above,

R_6 is hydrogen or C_{1-3}alkyl and

R_7 is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl,

the group $-CH(R_5)-X$ having the D- or L- configuration, and Y_1 and Y_2 are each hydrogen or together represent a direct bond, whereby the residues in the 1- and 6-position each independently have the L- or D-configuration.

30. A compound of formula



wherein

A is C_{1-12}alkyl, C_{7-10}phenylalkyl or a group of formula RCO-, whereby

i) R is hydrogen, C_{1-11}alkyl, phenyl or C_{7-10}phenylalkyl or

ii) RCO- is

a) an L- or D-phenylalanine residue optionally ring-substituted by F, Cl, Br, No_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy;

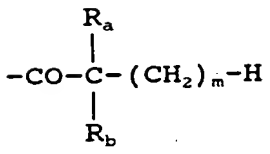
b) the residue of a natural or synthetic α-a-mino acid other than defined under a) above or of a corresponding D-amino acid, or

c) a dipeptide residue in which the individual amino acid residues are the same or different and are selected from those defined under a) and/or b) above,

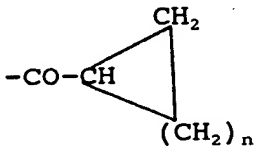
C_{1-8}alkanoyl,

A' is hydrogen,

Y_1 and Y_2 represent together a direct bond or each of Y_1 and Y_2 is independently hydrogen or a radical of formulae (1) to (5).



(1)



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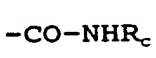

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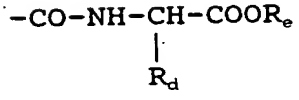

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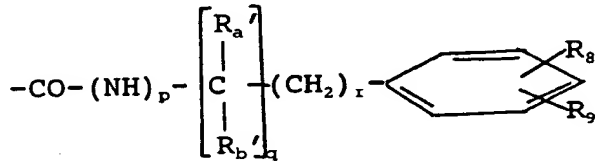


(5)

wherein

R_a is methyl or ethyl

R_b is hydrogen, methyl or ethyl

m is a whole number from 1 to 4

n is a whole number from 1 to 5

R_c is (C_{1-6})alkyl

R_d represents the substituent attached to the α-carbon atom of a natural or synthetic α-amino acid (including hydrogen)

R_e is (C_{1-5})alkyl

R_a' and R_b' are independently hydrogen, methyl or ethyl,

R_8 and R_9 are independently hydrogen, halogen, (C_{1-3})alkyl or (C_{1-3})alkoxy,

P is 0 or 1,

q is 0 or 1, and

r is 0, 1 or 2,

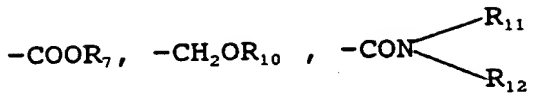
B is -Phe- optionally ring-substituted by halogen, NO_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy (including pentafluoroalanine), or ß-naphthyl-Ala

C is (L)-Trp- or (d)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen, NO_2, NH_2 OH, C_{1-3}alkyl and/or C_{1-3} alkoxy,

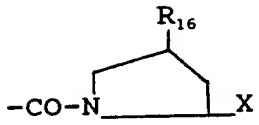
D is Lys, Lys in which the side chain contains O or S in ß-position, δF-Lys or δF-Lys, optionally α-N-methylated, or a 4-aminocyclohexylAla or 4-aminocyclohexylGly residue

E is The, Ser, Val, Phe, Ile or an aminoisobutyric or aminobutyric acid residue

G is a group of formula



or



wherein

R_7 is hydrogen or C_{1-3}alkyl,

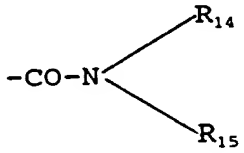
R_{10} is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

R_{11} is hydrogen, C_{1-9}alkyl, phenyl or C_{7-10}phenyl-alkyl,

R_{12} is hydrogen, C_{1-3}alkyl or a group of formula $-CH(R_{13})-X_1$,

R_{13} is CH_2OH, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, or $-CH(CH_3)OH$ or represents the substituent attached to the α-carbon atom of a natural or synthetic α-amino acid (including hydrogen) and

X_1 is a group of formula $-COOR_7$, $-CH_2OR_{10}$ or



wherein

R_7 and R_{10} have the meanings given above,

R_{14} is hydrogen or C_{1-3}alkyl and

R_{15} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl, and

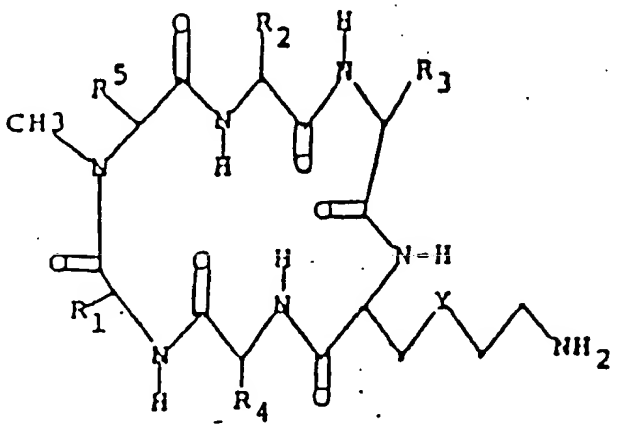
R_{16} is hydrogen or hydroxy,

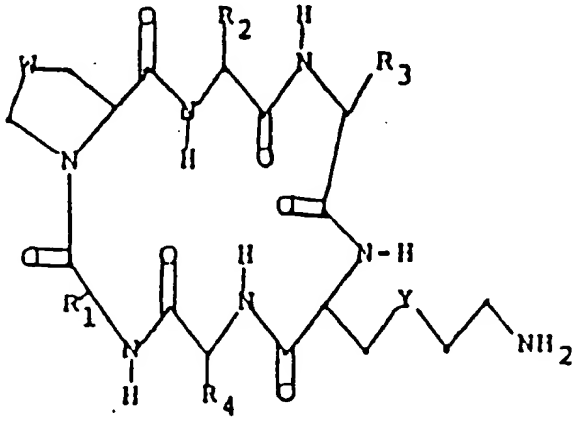
with the proviso that

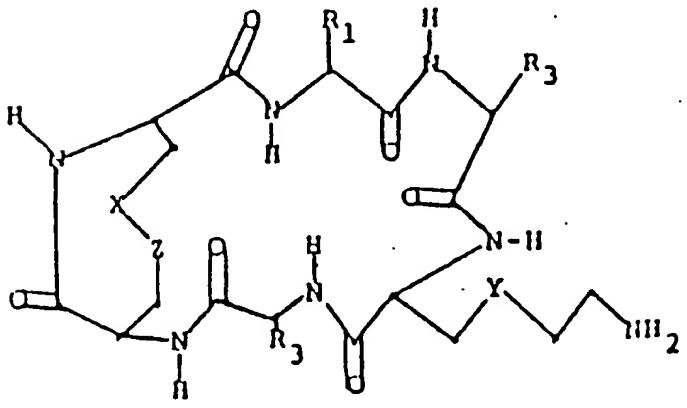
when R_{12} is $-CH(R_{13})-X_1$ then R_{11} is hydrogen or methyl,

wherein the residues B, D and E have the L-configuration, and the residues in the 2-and 7-position and any residues Y_1 4) and Y_2 4) each independently have the (L)- or (D)- configuration.

31. A somatostatin analog selected from the compounds of the following formulae



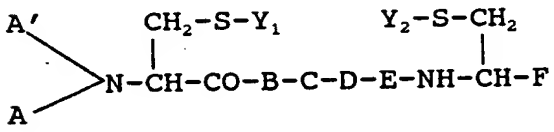




wherein

W is	S or $(CH_2)_s$ where s is 0, 1 or 2;
one of X and Z	is S and the other is S or CH_2;
Y is	S or $(CH_2)_t$ where t is 0, 1 or 2;
each of R_1 and R_2	independently of the other, is C_{1-5} alkyl, benzyl, benzyl having one or two C_{1-5} alkyl, halogen, hydroxy, amino, nitro, and/or C_{1-5} alkoxy substituents, or C_{1-5} alkyl substituted with 5- or 6- membered heterocyclic ring;
R_3 is	3-indolymethyl, either unsubstituted or having C_{1-5} alkyl, C_{1-5} alkoxy or halogen substitution;
R_4	C_{1-5} alkyl, C_{1-5} hydroxyalkyl, benzyl, carboxy-(C_{1-5} alkyl), amino (C_{1-5} alkyl) or benzyl having a C_{1-5} alkyl, halogen, hydroxy, amino, nitro and/or C_{1-5} alkoxy substituent;
R_5 is	C_{1-5} alkyl, benzyl, or benzyl having a C_{1-5} alkyl, halogen, hydroxy, amino, nitro, and/or C_{1-5} alkoxy substituent,

compounds of Formula



wherein

A is C_{1-12} alkyl, C_{7-10} phenylalkyl or a group of formula RCO-,

whereby

i) R is hydrogen, C_{1-11} alkyl, phenyl or C_{7-10} phenylalkyl, or

ii) RCO- is

a) an L- or D-phenylalanine residue optionally ring-substituted by F, Cl, Br, NO_2, NH_2, OH, C_{1-3} alkyl and/or C_{1-3} alkoxy

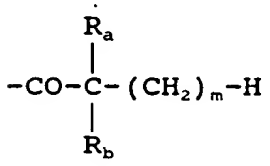
b) the residue of a natural α-amino acid other than defined under a) above or of a corresponding D-amino acid, or

c) a dipeptide residue in which the individual amino acid residues are the same or different and are selected from those defined under a) and/or b) above, the α-amino group or amino acid residues a) and b) and the N-terminal amino group of dipeptide residues c) being optionally mono- or di-C_{1-12} alkylated,

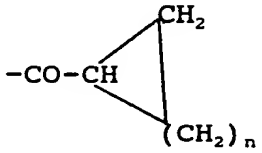
A' is hydrogen or, when A is C_{1-12} alkyl or C_{7-10} phenylalkalso C_{1-12} alkyl or C_{7-10} phenylalkyl,

Y_1 and Y_2 represent together a direct bond or

each of Y_1 and Y_2 is independently hydrogen or a radical of the formulae



(1)



(2)

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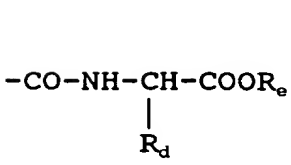

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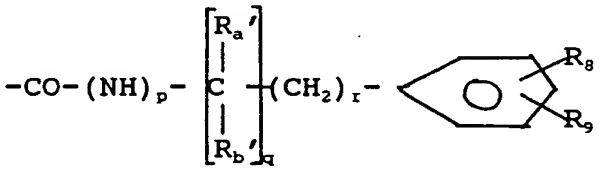


(5)

wherein R_a is methyl or ethyl

R_b is hydrogen, methyl or ethyl

m is a whole number from 1 to 4

n is a whole number from 1 to 5

R_c is (C_{1-6})alkyl

R_d represents the substituent attached to the α-carbon atom of a natural α-amino acid (including hydrogen)

R_e is (C_{1-5})alkyl

R_a' and R_b' are independently hydrogen, methyl or ethyl,

R_8 and R_9 are independently hydrogen, halogen, (C_{1-3})alkyl or (C_{1-3})alkoxy,

p is 0 or 1,

q is 0 or 1, and

r is 0, 1 or 2,

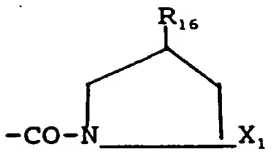
B is -Phe- optionally ring-substituted by halogen, No_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy, or naphthylalanine.

C is (L)-Trp- or (D)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen, No_2, NH_2, OH, C_{1-3} alkyl and/or C_{1-3} alkoxy,

D is -Lys-, ThiaLys, F-Lys, δF-Lys or Orn, optionally α-N-methylated, or a 4-aminocyclohexyl Ala or 4-aminocyclohexyl Gly residue,

E is Thr, Ser, Val, Phe, Ile or an aminoisobutyric acid residue

F is a group of formula $-COOR_7$, $-CH_2OR_{10}$, $-CON\begin{matrix}R_{11}\\R_{12}\end{matrix}$ or



wherein R_7 is hydrogen or C_{1-3}alkyl,

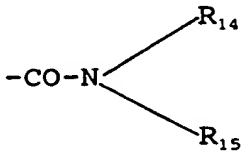
R_{10} is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

R_{11} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}-phenylalkyl,

R_{12} is hydrogen, C_{1-3}alkyl or a group of formula $-CH(R_{13})-X_1$,

R_{13} is CH_2OH, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, or $-CH(CH_3)OH$ or represents the substituent attached to the α-carbon atom of anatural α-amino acid (including hydrogen) and

X_1 is a group of formula $-COOR_7$, $-CH_2OR_{10}$ or



wherein

R_7 and R_{10} have the meanings given above,

R_{14} is hydrogen or C_{1-3}alkyl and

R_{15} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl, and

R_{16} is hydrogen or hydroxy,

with the proviso that

when R_{12} is $-CH(R_{13})-X_1$ then R_{11} is hydrogen or methyl,

wherein the residues B, D and E have the L-configuration, and the residues in the 2- and 7-position and any residues Y_1 4) and Y_2 4) each independently have the (L)- or (D)- configuration

and compounds of the following formulae

H-Cys-Phe-(D)Trp-Lys-Thr-Phe-Cys-OH

Asn-Phe-Phe-(D)Trp-Lys-Thr-Phe-Gaba

MeAla-Tyr-(D)Trp-Lys-Val-Ph

NMe-Phe-His-(D)Trp-Lys-Val-Ala.

32. Somatostatin analogs

X-Cys-D-o-Trp-E-F-Cys-Y I

X-Cys-Lys-Asn-Phe-D-o-Trp-E-F-Phe-Thr-Ser-Cys-Y II

I,II, X = N-terminus anchor; Y = C-terminus anchor, G-I or its alc; wherein at least I of X, Y = cationic anchor; D = Phe Tyr, 3-(p-fluorophenyl)alanine or 3 (p-chlorophenyl)alanine residue; E = Lys, Lys(R^1); R^1 = C_{1-8}(fluoro)alkyl; F = Thr, Val, Ser; G = D- or L-Thr, Phe, or 3-(2-naphthyl)alanine residue; I = OH, NH_2, NHR^1.

33. Peptides $RR^1NCHR^2CONHCH(CH_2SR^4)CO$-Phe-Trp-Lys-X-$NHCHR^3CH_2SR^5$ [R = inorg. or org. acyl group, R^1 = H, alkyl, $NCHR^2CO$ moiety = I.

$Me(CH_2)_8CO$-D-Phe-Cys-Phe-D-Trp-Lys-Thr-Cys-Thr-ol I

or D-Phe (optionally ring substituted by halo, NO_2, OH, alkyl. alkoxy); Phe, Trp, (D or L) ,may be ring substituted by NO_2, NH_2, OH, alkyl, alkoxy; Lys may be α-N-methylated and Σ-N-

alkylated; X = D- or L-α-amino acid residue optionally α-N-methylated; R^3 = CO_2H, CH_2OH, carbamoyl, R^4 = R^5 = H, R^4R^5 = bond]

34. H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-X-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-

Cys-X^1-x^2-Phe-Phe-D-Trp-Lys-Tys-Thr-X^3-X^4-X^5-X^6-OH

35. H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-Leu-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-

Cys-Lys-Asn-Phe-Phe-D-Trp-Lys-Thr-Tyr-Thr-Ser-Cys-OH

Said compounds (34 and 35) appear in Chemical Abstracts 98, 1983 1 43839 q

36. c(Spacer-Phe-D-Trp-Lys-Thr)

Spacer may stand for:

a) R,S-δ-Bn-o-AMPA

b) R-α-Bn-NMe-o-AMPA

c) Phe-Pro

Said cmpounds and similar ones appear in Brecx et al., Lett. Pept. Sci.1995, 2 (3/4): 165-8 , "Somatostatin analogs containing 0-aminium ethylphenyl acetic acid as a bridge unit"; and Tourwe, Lett. Pept. Sci. 1995, 2 (3/4): 182-6

37. H_2N-Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys-OH

38. H_2N-Ser-Ala-Asn-Ser-Asn-Pro-Ala-Met-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys-OH

39. D-ß-Nal-Cys-Tyr-D-Trp-Lys-Val-Cys-Thr-NH_2

40. Ac-Phe-Lys-Phe-D-Trp-Lys-Thr-Lys-Thr-NH_2

41. D-Phe-Lys-Phe-D-Trp-Lys-Thr-Lys-Trp-NH_2

42. D-Trp-Lys-Phe-D-Trp-Lys-Thr-Lys-Thr-NH_2

43. D-Phe-Lys-Tyr-D-Trp-Lys-Val-Lys-Thr-NH_2

44. D-Phe-Lys-Tyr-D-Trp-Lys-Val-Lys-Trp-NH_2

45. 3-(2-naphthyl)-D-Ala-Lys-Tyr-D-Trp-Lys-Val-Lys-Thr-NH_2

The pharmaceutical preparation according to the present invention may also comprise additional compounds such as compounds having an additional pharmaceutical effect, carriers, solvents, emulgamators, etc.

The present invention also comprises a method for the treatment of the risk factors of syndrome X of Reaven by applying to a patient a pharmaceutically effective dosage of the above pharmaceutically preparation.

Said dosage should preferably not exceed 50μg/kg/day of the active ingredient (calculated on Octreotide), preferably not exceeding 40μ/kg/day. Said dosage is given in any suitable manner. It may be given as one portion once a day or even in two days when given in slow release form, or being divided into 3-4 dosages which are applied in equal periods of time, etc.

Said dosage has to be re-calculated on the basis of the analog being the active ingredient. Moreover, the exact dosages have to be adapted to the condition of the patients and to its specific properties e.g. weight, age, etc.

The composition may be administered in various manners. This depends in particular on the analog being the active ingredient. Thus octreotide is advantageously injected sub-cutaneously as a saline solution. Cyclo(N-Me-Ala-Tyr-D-Trp-Lys-Val-Phe) is advantageously administered per os.

The treatment is performed, as indicated above, against the risk factors of syndrome X of Reaven, in particular against the following diseases in order to primarily and secondarily to prevent and to treat:

A. Periferal vascular diseases (Arteriosclerosis) in order to

prevent:

1. Ichemic Heart diseases, e.g. Angina Pectoris and Myocard Infarcts;
2. Cerebral vascular diseases in order to prevent Transient Ischemic attack (TIA) and Cerebrovascular accident (CVA);
3. Intermittent Claudication;
4. Ischemic Bowel disease; and
5. Impotence due to a Periferal; vascular disease.

B. Prevent excessive blood coagulation (high PAI-1 in the blood) in order to primarily prevent MI, CVA, Renal vein trombosis, etc.

C. Lower body weight which is also a risk factor Arthero-sclerosis, high blood pressure

Said diseases are mainly caused, as indicated above, by a high resistance to Insulin.

The present invention will now be illustrated with reference to the following experiment (all injections are given into the hollow space of the Peritoneum):

60 fat male rats of the Zucker species, aged 7 weeks having an average weight of 225 g. 54 rats of same are divided into 3 groups:

Group A receives injections of Octreotide in a 0.9% NaCl saline solution in a high dosage (40μg/kg/day);

Group B receives injections of Octreotide in a 0.9% NaCl saline solution in a low dosage (20 μg/kg/day); and

Group C the control group, receives an injection of a 0.9% saline solution. The volume of the 0.9% NaCl is identical with the volume being injected into Group A and B (At the beginning of the tests the rats have approximately the identical weight and they therefore receive the identical volume of injections).

All rats receive the same amount of Food (Pair Fed). Said amount is chosen according to the group eating the lowest amount. Thus, the influence of the drug is isolated.

The rats are located in a room changing light and darkness in order to simulate natural surroundings, as in general they eat in darkness. The rats drink water freely.

The rats are weighed twice a week. At the end of the experiment the rate change of the weight is being calculated. The amount of food eaten per week is measured and the amount eaten each day is calculated. (The influence of the Octreotide on the amount of food eaten by the rates is not checked. They eat the identical amount of food.)

Six rats are tested before the beginning of the experiment. Six rats from each group are separated after 2 weeks, 4 weeks and 8 weeks and an Intra-Peritoneal Glucose Tolerance Test (GTT 1.0g Glucose/kg BW) is performed after fasting of 12 hours during which the rats do not receive any medicament or food.

Blood is taken from the Supra-orbital sinus with slow anaesthesia with CO_2.

At zero time, i.e. before the Glucose load 2 cc of blood are taken from each rat.

½ cc of blood is put into a test tube which contains Heparin and the concentration of Glucose and Insulin is determined; and

½ cc of blood is put into a test tube which contains Na_2EDTA 0.1% and the concentration of Cholesterol, Triglycerides, HDL and LDL are determined.

At 15, 30 and 60 minutes after the Glucose load ½ cc of blood is taken from each rat and put into a test tube which contains Heparin and the concentration of Glucose and Insulin is determined.

After the Glucose tolerance test each tested rat "leaves" the experiment.

The materials used in the experiments:

Octreoide manufactured by Sandoz Basel.

0.9% NaCl

30% Glucose

Not sterilized food for mice and rats manufactured by Kofolk, Petach Tikva. Catalogue No. 19510. Gross energy 3,950 kCal/kg. Digestibality energy of the food in rats 3,150 kCal/kg.

The laboratory tests are performed as follows:

1. Glucose is tested by the Glucose Oxidase method in a kit of Boehringer Mannheim called Glucose GOD-Perid Method 2 x 300ml catalogue No. 124028. The test is performed on the day or the following day on which the blood is taken.

2. The Insulin is tested by the Radio Immuno Assay (RIA) by a SB INSIK-5 kit of Sorin Biomedica.

The method is performed by the general method known for the test of Insulin by said kit.

3. The total Cholesterol is tested by the CHOD-PAP method. The total cholesterol comprises VLDL + LDL + HDL. The kit with which the test is performed is manufactured by Boehringer Mannheim and the cholesterol reagent is MPA3 catalogue No. 236691 4 x 500ml.

The HDL is tested by precipitating LDL and VLDL with Heparin MnCl2 and then the total cholesterol is tested. VLDL is calculated by T.G./5. LDL is calculated by the formula

LDL = totaL cholesterol - (VLDL + HDL)

4. The triglyceride are being tested by the peridochrom T.G. GPO-PAP method. The kit is manufactured by Boehringer Mannheim and the reagent has catalogue No. 701904 15 x 32ml.

The data received are worked up by standard methods for this

purpose. The results show that the Insulin resistance is significantly lowered, i.e. there is an increase in the level of HDL and a decrease in the level of LDL and of Triglycerides. A decrease in the rate of weight gain of young obese rats is observed, which implies a decrease in the weight gain of adult obese rats.

The Insulin resistance (Insulin Sensitivity Index is determined using the dynamic test - the Glucose Tolerance test (GTT). An integration of the area under the curve (AMC) Glucose and Insulin in the period of 1½ hours is measured and the determination of the ratio between them gives a good estimate of the Insulin resistance.

Claims:

1. A pharmaceutical composition for the treatment of the risk factors of syndrome X of Reaven comprising as active ingredient somatostatin or one of its analogs (as herein defined).
2. A pharmaceutical composition comprising an additional compound.
3. A pharmaceutical composition comprising an additional compound having an additional pharmaceutical effect.
4. A pharmaceutical composition according to Claim 2 or 3 wherein the additional compound is selected among carriers, solvents and emulgamators.
5. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is Octreotide.
6. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is Vapreotide.
7. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is Lanreotide.
8. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are Cyclopeptide somatostatin analogues selected among :

Cyclo[Pro-Phe-D-Trp-Lys-Thr-Phe]

Cyclo[N-Me-Ala-Tyr-D-Trp-Lys-Val-Phe]

Cyclo[Pro-Ala-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Tyr-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-γ-aminobutyric-Phe]

Cyclo[N-Me-Ala-Phe-D-Trp-Lys-Thr-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-Val-Phe]

Cyclo[D-Ala-D-Phe-D-Trp-L-Lys-D-Thr-N-Me-D-Phe]

Cyclo[Pro-Phe-D-Trp-Lys-Thr(Bzl)] (Bzl = (a)

Cyclo[Pro-Phe-D-Trp-Lys-Thr]

Cyclo[Pro-D-Phe-D-Trp-Lys-Thr(Bzl)]

Cyclo[Ahep-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Tyr-Thr-Ser] (Ahep =(b)

Cyclo[Ahep-Phe-D-Trp-Lys-Thr(Bzl)]

Cyclo[Ahep-Phe-D-Trp-Lys-Thr]

Cyclo[Ahep-Phe-D-Trp-Lys-Ser(Bzl)]

Cyclo[Ahex-Phe-D-Trp-Lys-Thr(Bzl)] (Ahex = (c)

Cyclo[Aoct-Phe-D-Trp-Lys-Thr(Bzl)] (Aoct = (d)

Cyclo[Ala-Cys-Phe-D-Trp-Lys-Thr-Cys]

(a) Bzl = benzyl

(b) Ahep = 7-aminoheptanoyl

(c) Ahex = 6-aminohexanoyl

(d) Aoct = 8-amino-octanoyl;

9. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-[Cys-Phe-D-Trp-Lys-Thr-Cys]-Thr-ol

10. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Nal-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Thr-NH_2 (Nal = (1)

11. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Nal-NH_2

12. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-[Cys-Tyr-D-Trp-Lys-Thr-Cys]-Nal-NH_2

13. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-[Cys-Tyr-D-Trp-Lys-Abu-Cys]-Nal-NH_2 (Abu = (2)

14. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-[Cys-Tyr-D-Trp-Lys-Ser-Cys]-Nal-NH_2

15. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Nal-[Cys-Tyr-D-Trp-Lys-Val-Cys]-Nal-NH_2

16. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

c(Ahep-Trp-D-Trp-Lys-Thr-Phe) (Ahep = (3)

17. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Cpa-Tyr-D-Trp-Lys-Thr-Phe-Thr-NH_2 (Cpa = (4)

18. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Cpa-Tyr-D-Trp-Lys-Val-Phe-Thr-NH_2

19. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Phe-D-Trp-Lys-Thr-Phe-Thr-NH_2

20. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Phe-D-Trp-Lys-Val-Phe-Thr-NH_2

21. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Tyr-D-Trp-Lys-Val-Phe-D-Nal-NH_2

22. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Ala-Phe-D-Trp-Lys-Ala-Nal-NH_2

23. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Phe-D-Trp-Lys-Val-Phe-Thr-NH_2

24. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Phe-D-Trp-Lys-Thr-Phe-Thr-NH_2

25. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Phe-Tyr-D-Trp-Lys-Val-Phe-D-Nal-NH2

26. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are polypeptides of the formula:

X-Lys-Asn-Phe-Phe-A-Lys-Thr-Phe-Thr-Ser-Y

wherein A is L- or D-Trp,

X is H-$(Aeg)_m$-Cys- or H-$(Aeg)_m$-Ala-Gly-Cys-,

Y is -Cys-$(Aeg)_n$-OH or

X and Y taken together are a 2-aminoethyl-glycyl group in the ring position and

m and n are 0, 1, 2, provided that

m and n are at least 1,

and their cyclic disulfide derivatives.

27. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are peptides of the formula:

Bmp-Lys-X-Phe-Phe-trp-Lys-Thr-Phe-Thr-Y-Cys-OH

3 4 5 6 7 8 9 10 11 12 13 14

in which

Bmp represents the desaminocysteine radical,

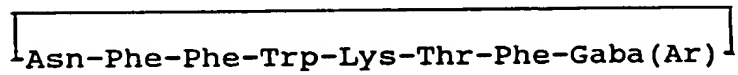
X represents Asn,

trp represents D-Trp that may be substituted in the benzene ring by a halogen atom, and

Y represents the radical of an alpha-(lower alkyl)amino-(lower alkyl)-carboxylic acid having a minimum of 4 and a maximum of 8 carbon atoms, in which the two lower alkyl radicals can be connected to one another with

a single C-C bond, an oxygen atom or a sulphur (II) atom.

28. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are cyclic octapeptides of the formula



in which

Trp represents L-Trp or D-Trp, in which the benzene ring may be substituted by a fluorine atom, and

Gaba(Ar) represents the residue of a γ-aminobutyric acid substituted by a cyclic hydrocarbyl radical Ar selected from the group consisting of cyclohexyl; phenyl optionally substituted by halogen, nitro or phenoxy; and naphthyl optionally substituted by halogen.

29. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are compounds of formula

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-R_8

-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-Cys-R_{18}-R_{19}-Phe-Phe-D

-Trp-Lys-Thr-R_{25}-R_{26}-R_{27}-R_{28}-OH wherein R_8 is

Met or Leu, R_{18} is Lys or des R_{18}, R_{19} is Asn or

des R_{19}, R_{25} is Phe or Tyr, R_{26} is Thr or des

R_{26}, R_{27} is Ser or D-Ser and R_{28} is D-Cys or Cys.

30. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are compounds of formula

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-R_8-Ala-Pro

-Arg-Glu-Arg-Lys-Ala-Gly-Cys-R_{18}-R_{19}-Phe-Phe-D-Trp-Lys

-Thr-R_{25}-R_{26}-R_{27}-R_{28}-OH wherein R_8 is Met or

Leu, R_{18} is Lys or des R_{18}, R_{19} is Asn or des

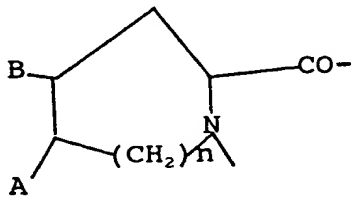
R_{19}, R_{25} is Phe or Tyr, R_{26} is Thr or des R_{26},

R_{27} is Ser or D-Ser and R_{28} is D-Cys or Cys, or the linear version thereof where the disulfide bridge is replaced by hydrogen.

31. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are cyclic hexapeptides of the formula

X - Phe-D-Trp-Lys-Y-Phe

in which X represents the radical of an L-aminoacid of the formula



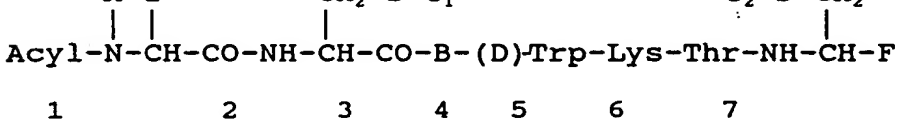
in which A and B are identical or different and denote alkyl having 1 to 3 carbon atoms, or A and B together represent a saturated, unsaturated or aromatic monocyclic or bicyclic structure having 3 to 6 carbon atoms,

n denotes 0 or 1, and

Y represents an aliphatic or aromatic L-aminoacid the side-chair of which can be hydroxylated, said amino acid being selected from the group consisting of L-alanine, L-serine, L-valine, L-leucine, L-isoleucine, L-phenylalanine and L-

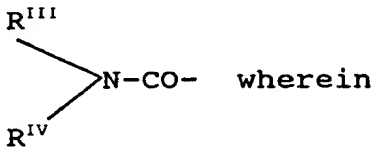
tyrosine.

32. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are N-acyl-polypeptides of formula,



wherein

"Acyl" is a group of formula $R^{I}CO-$ wherein R^{I} is C_{1-20} alkyl or phenyl; a group of formula $R^{II}SO_2-$ wherein R^{II} is $C_{1-20}-$ alkyl, phenyl or tolyl; a group



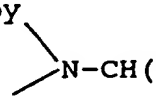
wherein

R^{III} and R^{IV} are each independently hydrogen or C_{1-10}alkyl; or biotinyl,

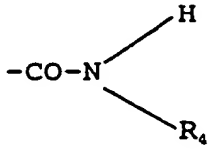
A is hydrogen or C_{1-3}alkyl,

>N-CH(Z)-CO- is an (L)- or (D)-phenylalanine residue optionally ring-substituted by NO_2, or an (L) or (D)-norleucine residue,

whereby

Z in  N-CH(Z)-CO- represents the remainder of said residue,

B is -Phe- optionally ring-substituted by NO_2,

F is a group of formula 

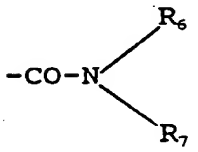
wherein R_4 is hydrogen or a group of formula

$-CH(R_5)-X$,

R_5 is $CH_3CH(OH)-$, i-butyl or benzyl

X is a group of formula $-COOR_1$,

$-CH_2OR_2$ or



wherein R_1, R_6 and R_7 are each hydrogen or C_{1-3}alkyl, and

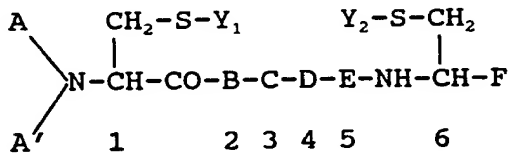
R_2 is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

the group $-CH(R_5)-X$ having the (D)- or (L)-configuration, and

Y_1 and Y_2 are each hydrogen or together represent a direct bond, whereby the residue resides in the 2- and 7-position each indepen-dently have the (L)- or (D)-configuration, and with the proviso that:

i) (L)- and/or (D)-cysteine residues are present at the 2- and 7-positions only.

33. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are polypeptides of the formula



wherein

A is C_{1-12}alkyl, C_{7-10}phenylalkyl or a group of formula RCO-, whereby

i) R is hydrogen, C_{1-11}alkyl, phenyl or

C_{7-10}phenylalkyl, or

ii) RCO- is a) an L- or D-phenylalanine residue optionally ring-substituted by halogen and/or C_{1-3}alkyl,

b) H-Asn-, or

c) H-Nle-Asn-,

the α-amino group of amino acid residues a) and b) and the N-terminal amino group of dipeptide residues c) being optionally mono- or di-C_{1-12}alkylated,

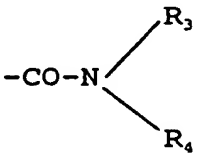
A' is hydrogen or, when A is C_{1-12}alkyl or C_{7-10}phenylalkyl, also C_{1-12}alkyl or C_{7-10}phenylalkyl,

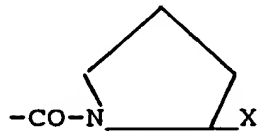
B is -Phe-optionally ring-substituted by halogen and/or C_{1-3}alkyl,

C is -(L)- or -(D)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen and/or C_{1-3}alkyl,

D is -Lys- optionally α-N-methylated and optionally Σ-N-C_{1-3}-alkylated,

E is -Thr- or -Ala- each in (D)- or (L)-form and each being optionally α-N-methylated,

F is a group of formula $-COOR_1$, $-CH_2OR_2$,  or



wherein R_1 is hydrogen or C_{1-3}alkyl,

R_2 is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable

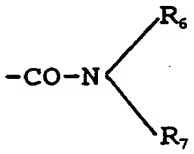
ester,

R_3 is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}-phenylalkyl,

R_4 is hydrogen, C_{1-3}alkyl or, when R_3 is hydrogen or methyl, also a group of formula $-CH(R_5)-X$,

R_5 is hydrogen, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, $-CH_2-OH$, $-CH(CH_3)-OH$, isobutyl or benzyl

X is a group of formula $-COOR_1$, $-CH_2OR_2$ or



wherein

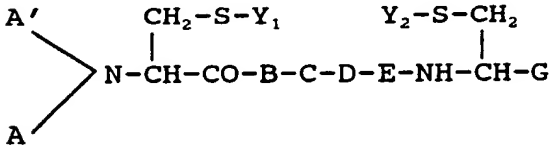
R_1 and R_2 have the meanings given above,

R_6 is hydrogen or C_{1-3}alkyl and

R_7 is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl,

the group $-CH(R_5)-X$ having the D- or L- configuration, and Y_1 and Y_2 are each hydrogen or together represent a direct bond, whereby the residues in the 1- and 6-position each independently have the L- or D-configuration.

34. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is a compound of formula



wherein

A is C_{1-12}alkyl, C_{7-10}phenylalkyl or a group of formula RCO-,

whereby

i) R is hydrogen, C_{1-11}alkyl, phenyl or C_{7-10}phenylalkyl or

ii) RCO- is

a) an L- or D-phenylalanine residue optionally ring-substituted by F, Cl, Br, No_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy;

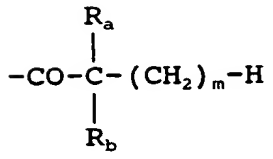
b) the residue of a natural or synthetic α-a-mino acid other than defined under a) above or of a corresponding D-amino acid, or

c) a dipeptide residue in which the individual amino acid residues are the same or different and are selected from those defined under a) and/or b) above,

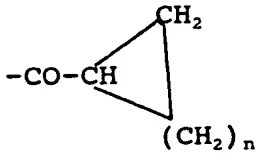
C_{1-8}alkanoyl,

A′ is hydrogen,

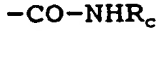
Y_1 and Y_2 represent together a direct bond or each of Y_1 and Y_2 is independently hydrogen or a radical of formulae (1) to (5).



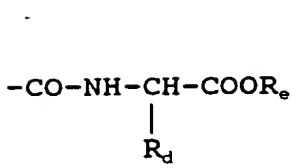
(1)



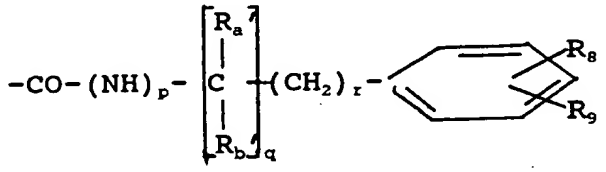
(2)



(3)



(4)



(5)

wherein

R_a is methyl or ethyl

R_b is hydrogen, methyl or ethyl

m is a whole number from 1 to 4

n is a whole number from 1 to 5

R_c is (C_{1-6})alkyl

R_d represents the substituent attached to the α-carbon atom of a natural or synthetic α-amino acid (including hydrogen)

R_e is (C_{1-5})alkyl

R_a' and R_b' are independently hydrogen, methyl or ethyl,

R_8 and R_9 are independently hydrogen, halogen, (C_{1-3})alkyl or (C_{1-3})alkoxy,

P is 0 or 1,

q is 0 or 1, and

r is 0, 1 or 2,

B is -Phe- optionally ring-substituted by halogen, NO_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy (including pentafluoroalanine), or ß-naphthyl-Ala

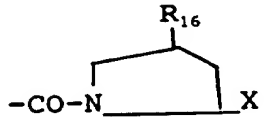
C is (L)-Trp- or (d)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen, NO_2, NH_2 OH, C_{1-3}alkyl and/or C_{1-3} alkoxy,

D is Lys, Lys in which the side chain contains O or S in ß-position, ζF-Lys or δF-Lys, optionally α-N-methylated, or a 4-aminocyclohexylAla or 4-aminocyclohexylGly residue

E is The, Ser, Val, Phe, Ile or an aminoisobutyric or aminobutyric acid residue

G is a group of formula

$-COOR_7$, $-CH_2OR_{10}$, $-CON(R_{11})(R_{12})$ or



wherein

R_7 is hydrogen or C_{1-3}alkyl,

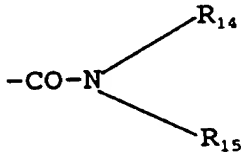
R_{10} is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

R_{11} is hydrogen, C_{1-9}alkyl, phenyl or C_{7-10}phenyl-alkyl,

R_{12} is hydrogen, C_{1-3}alkyl or a group of formula $-CH(R_{13})-X_1$,

R_{13} is CH_2OH, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, or $-CH(CH_3)OH$ or represents the substituent attached to the α-carbon atom of a natural or synthetic α-amino acid (including hydrogen) and

X_1 is a group of formula $-COOR_7$, $-CH_2OR_{10}$ or



wherein

R_7 and R_{10} have the meanings given above,

R_{14} is hydrogen or C_{1-3}alkyl and

R_{15} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl, and

R_{16} is hydrogen or hydroxy,

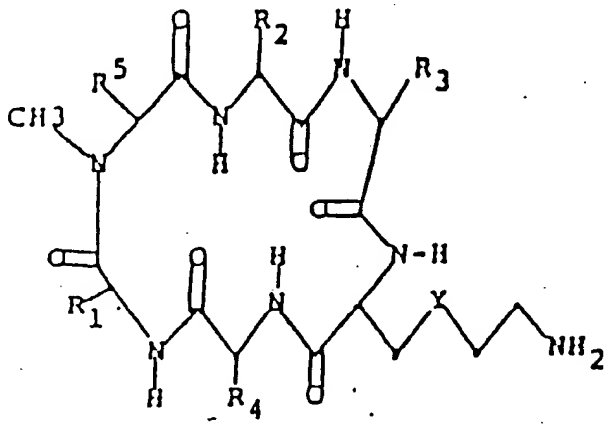
with the proviso that

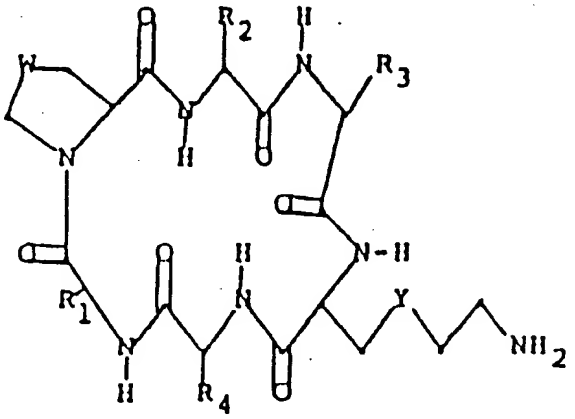
when R_{12} is $-CH(R_{13})-X_1$ then R_{11} is hydrogen or methyl,

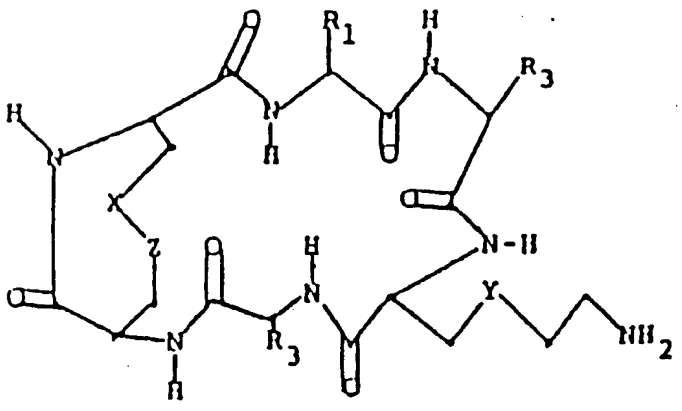
wherein the residues B, D and E have the L-configuration, and the residues in the 2-and 7-position

and any residues Y_1 4) and Y_2 4) each independently have the (L)- or (D)- configuration.

35. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is a somatostatin analog selected from the compounds of the following formulae







wherein

W is S or $(CH_2)_s$ where s is 0, 1 or 2;

one of X and Z is S and the other is S or CH_2;

Y is S or $(CH_2)_t$ where t is 0, 1 or 2;

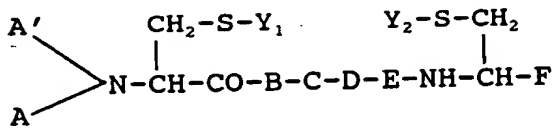
each of R_1 and R_2 independently of the other, is C_{1-5} alkyl, benzyl, benzyl having one or two C_{1-5} alkyl, halogen, hydroxy, amino, nitro, and/or C_{1-5} alkoxy substituents, or C_{1-5} alkyl substituted with 5- or 6- membered heterocyclic ring;

R_3 is 3-indolymethyl, either unsubstituted or having C_{1-5} alkyl, C_{1-5} alkoxy or halogen substitution;

R_4 C_{1-5} alkyl, C_{1-5} hydroxyalkyl, benzyl, carboxy-(C_{1-5} alkyl), amino (C_{1-5} alkyl) or benzyl having a C_{1-5} alkyl, halogen, hydroxy, amino, nitro and/or C_{1-5} alkoxy substituent;

R_5 is C_{1-5} alkyl, benzyl, or benzyl having a C_{1-5} alkyl, halogen, hydroxy, amino, nitro, and/or C_{1-5} alkoxy substituent,

compounds of formula



wherein

A is C_{1-12} alkyl, C_{7-10} phenylalkyl or a group of formula RCO-, whereby

i) R is hydrogen, C_{1-11} alkyl, phenyl or C_{7-10} phenylalkyl, or

ii) RCO- is

a) an L- or D-phenylalanine residue optionally ring-substituted by F, Cl, Br, NO_2, NH_2, OH, C_{1-3} alkyl and/or C_{1-3} alkoxy

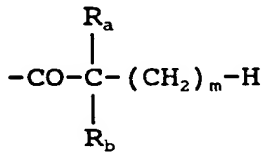
b) the residue of a natural α-amino acid other than defined under a) above or of a corresponding D-amino acid, or

c) a dipeptide residue in which the individual amino acid residues are the same or different and are selected from those defined under a) and/or b) above, the α-amino group or amino acid residues a) and b) and the N-terminal amino group of dipeptide residues c) being optionally mono- or di-C_{1-12} alkylated,

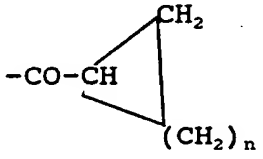
A' is hydrogen or, when A is C_{1-12} alkyl or C_{7-10} phenylalkalso C_{1-12} alkyl or C_{7-10} phenylalkyl,

Y_1 and Y_2 represent together a direct bond or

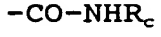
each of Y_1 and Y_2 is independently hydrogen or a radical of the formulae



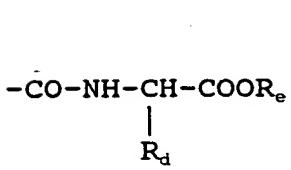
(1)



(2)



(3)



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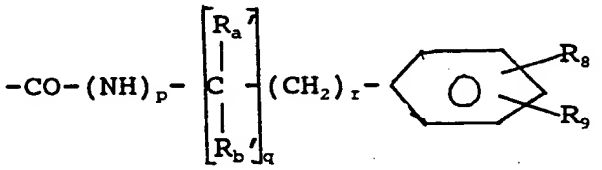


(5)

wherein R_a is methyl or ethyl

R_b is hydrogen, methyl or ethyl

m is a whole number from 1 to 4

n is a whole number from 1 to 5

R_c is (C_{1-6})alkyl

R_d represents the substituent attached to the α-carbon atom of a natural α-amino acid (including hydrogen)

R_e is (C_{1-5})alkyl

R_a' and R_b' are independently hydrogen, methyl or ethyl,

R_8 and R_9 are independently hydrogen, halogen, (C_{1-3})alkyl or (C_{1-3})alkoxy,

p is 0 or 1,

q is 0 or 1, and

r is 0, 1 or 2,

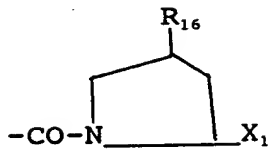
B is -Phe- optionally ring-substituted by halogen, No_2, NH_2, OH, C_{1-3}alkyl and/or C_{1-3}alkoxy, or naphthylalanine.

C is (L)-Trp- or (D)-Trp- optionally α-N-methylated and optionally benzene-ring-substituted by halogen, No_2, NH_2, OH, C_{1-3} alkyl and/or C_{1-3} alkoxy,

D is -Lys-, ThiaLys, F-Lys, δF-Lys or Orn, optionally α-N-methylated, or a 4-aminocyclohexyl Ala or 4-aminocyclohexyl Gly residue,

E is Thr, Ser, Val, Phe, Ile or an aminoisobutyric acid residue

F is a group of formula $-COOR_7$, $-CH_2OR_{10}$, $-CON\begin{matrix}R_{11}\\R_{12}\end{matrix}$ or



wherein R_7 is hydrogen or C_{1-3}alkyl,

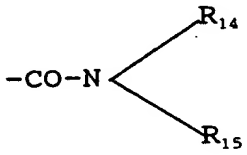
R_{10} is hydrogen or the residue of a physiologically acceptable, physiologically hydrolysable ester,

R_{11} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}-phenylalkyl,

R_{12} is hydrogen, C_{1-3}alkyl or a group of formula $-CH(R_{13})-X_1$,

R_{13} is CH_2OH, $-(CH_2)_2-OH$, $-(CH_2)_3-OH$, or $-CH(CH_3)OH$ or represents the substituent attached to the α-carbon atom of a natural α-amino acid (including hydrogen) and

X_1 is a group of formula $-COOR_7$, $-CH_2OR_{10}$ or



wherein

R_7 and R_{10} have the meanings given above,

R_{14} is hydrogen or C_{1-3}alkyl and

R_{15} is hydrogen, C_{1-3}alkyl, phenyl or C_{7-10}phenylalkyl, and

R_{16} is hydrogen or hydroxy,

with the proviso that

when R_{12} is $-CH(R_{13})-X_1$ then R_{11} is hydrogen or methyl,

wherein the residues B, D and E have the L-configuration, and the residues in the 2- and 7-position and any residues Y_1 4) and Y_2 4) each independently have the (L)- or (D)- configuration

and compounds of the following formulae

H-Cys-Phe-(D)Trp-Lys-Thr-Phe-Cys-OH

Asn-Phe-Phe-(D)Trp-Lys-Thr-Phe-Gaba

MeAla-Tyr-(D)Trp-Lys-Val-Ph

NMe-Phe-His-(D)Trp-Lys-Val-Ala

36. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are Somatostatin analogs

X-Cys-D-o-Trp-E-F-Cys-Y I

X-Cys-Lys-Asn-Phe-D-o-Trp-E-F-Phe-Thr-Ser-Cys-Y II

I,II, X = N-terminus anchor; Y = C-terminus anchor, G-I or its alc; wherein at least I of X, Y = cationic anchor; D = Phe Tyr, 3-(p-fluorophenyl)alanine or 3 (p-chlorophenyl)alanine residue; E = Lys, Lys(R^1); R^1 = C_{1-8}(fluoro)alkyl; F = Thr, Val, Ser; G = D- or L-Thr, Phe, or 3-(2-naphthyl)alanine residue; I = OH, NH_2, NHR^1.

37. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analogs are peptides:

$RR^1NCHR^2CONHCH(CH_2SR^4)CO$-Phe-Trp-Lys-X-$NHCHR^3CH_2SR^5$

[R = inorg. or org. acyl group, R^1 = H, alkyl, $NCHR^2CO$ moiety = I.

$Me(CH_2)_8CO$-D-Phe-Cys-Phe-D-Trp-Lys-Thr-Cys-Thr-ol I

or D-Phe (optionally ring substituted by halo, NO_2, OH, alkyl. alkoxy); Phe, Trp, (D or L) ,may be ring substituted by NO_2, NH_2, OH, alkyl, alkoxy; Lys may be α-N-methylated and Σ-N-alkylated; X = D- or L-α-amino acid residue optionally α-N-methylated; R^3 = CO_2H, CH_2OH, carbamoyl, R^4 = R^5 = H, R^4R^5 = bond]

38. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-X-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-

Cys-X^1-x^2-Phe-Phe-D-Trp-Lys-Tys-Thr-X^3-X^4-X^5-X^6-OH

39. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

H-Ser-Ala-Asn-Ser-Asn-Pro-Ala-Leu-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-

Cys-Lys-Asn-Phe-Phe-D-Trp-Lys-Thr-Tyr-Thr-Ser-Cys-OH

40. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is

c(Spacer-Phe-D-Trp-Lys-Thr)

Spacer may stand for:

a) R,S-δ-Bn-o-AMPA

b) R-α-Bn-NMe-o-AMPA

c) Phe-Pro

41. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

H_2N-Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys-OH

42. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

H_2N-Ser-Ala-Asn-Ser-Asn-Pro-Ala-Met-Ala-Pro-Arg-Glu-Arg-Lys-Ala-Gly-Cys-Lys-Asn-Phe-Phe-Trp-Lys-Thr-Phe-Thr-Ser-Cys-OH

43. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-ß-Nal-Cys-Tyr-D-Trp-Lys-Val-Cys-Thr-NH_2

44. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

Ac-Phe-Lys-Phe-D-Trp-Lys-Thr-Lys-Thr-NH_2

45. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Lys-Phe-D-Trp-Lys-Thr-Lys-Trp-NH_2

46. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Trp-Lys-Phe-D-Trp-Lys-Thr-Lys-Thr-NH_2

47. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Lys-Tyr-D-Trp-Lys-Val-Lys-Thr-NH_2

48. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

D-Phe-Lys-Tyr-D-Trp-Lys-Val-Lys-Trp-NH_2

49. A pharmaceutical composition according to any of Claims 1 to 4, wherein the analog is:

3-(2-naphthyl)-D-Ala-Lys-Tyr-D-Trp-Lys-Val-Lys-Thr-NH_2

50. A method for the treatment of symptoms of syndrome X by applying to a patient a pharmaceutically effective dosage of the pharmaceutical preparation according to any of Claims 1 to 49.

51. A method according to Claim 50, wherein the pharmaceutically effective dosage (calculated on octreotide) does not exceed 50µ/kg/day.

52. A method according to Claim 51, wherein said dosage does not exceed 40μ/kg/day.

53. A method according to any of Claims 50 to 52 wherein the analog is Octreotise which is applier in the form of an injection in a 0.9% saline solution.

54. Use of somatostatin or one of its analogs (as herein defined) in the preparation for the treatment of the risk factors of syndrome X of Reaven substantially as described in the specification.

For the Applicant:

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By: